ENTOMOLOGY ABOVE TIMBERLINE: II. THE ATTRACTION OF LADYBIRD BEETLES TO MOUNTAIN TOPS

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I have devoted eight summers to the task of climbing every major mountain in Glacier National Park, Montana, as a special research project in connection with my duties as Ranger Naturalist in that park. The primary object of these ascents was the compilation of detailed guide sheets describing the best routes up each peak, but I took advantage of the opportunity to also make many entomological observations far above timberline on those rugged mountains. Although all kinds of arthropods were sought, I was especially interested in becoming familiar with the Coleoptera and Diptera of that rigorous environment. Some general aspects of entomology above timberline were recently discussed in the Mazama Club Annual (Edwards 1956), but the subject is so vast that it should be more leisurely covered in a series of more specific publications. The present article is intended to be the first of these more detailed treatments, and will discuss only the mountain-frequenting Coccinellidae.

The enigmatic behavior of ladybird beetles above timberline is certainly interesting to many coleopterists, and our ignorance of the factors involved should reveal the need for further research on alpine insects in general. My acquaintance with the problem began on 19 June 1952, when I climbed Pinnacle Peak, Washington (on the south side of Mt. Rainier). There at nearly 7,000 feet, surrounded by thousands of acres of spring snowfields, I encountered a living scourge of "ladybugs." They swarmed over my body and face, they violated my lunch, and they tried to crawl into the lens of my camera. I had to brush them off my sandwiches between bites and shake them out of the camera between exposures. For months thereafter I found squashed ladybug remnants in odd places in my equipment. They were mostly *Hippodamia oregonensis* Cr., but there were also many *H. 5-signata* Kby. and a few *Coccinella nivicola monticola* Muls. I was especially surprised because on two previous climbs of this peak I had not noticed any large numbers of the beetles (although on 27 June 1948 I collected one specimen of *H. oregonensis* in the snow near the summit).

After leaving Washington I travelled to Montana, where I discovered thousands of ladybird beetles atop 9,365 foot Allen Mountain in Glacier National Park on 3 July 1952. Beneath each large slab of limestone near the summit cairn were hundreds of ladybugs, but they did not annoy me that time, because they were all dead (and had apparently been so for

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several months). In contrast to this abundance of corpses, not a single live one was seen on the summit at that time. I had already made more than 30 major climbs in the Park, but had never seen more than two or three ladybugs on any other peak, even though I usually looked carefully beneath the rocks on the summit for insects and spiders. During the next four summers I continued to climb mountains at least one or two days every week, but never discovered any other congregations of ladybugs (dead or alive) above timberline. Meanwhile I induced many other climbers en route to Allen Mountain to look for beetles under the rocks on top, but with no success evident until 1956. Near the end of June that year a party reported no ladybirds at the summit, but on 9 July 1956 Jerry Barnes found them present there by the hundreds. He stated that they were extremely annoying to him during his stay on top, but he found no dead beetles beneath the rocks there. During the summer much more climbing was done than ever before in this area, including at least four additional ascents of Allen Mountain, but no other parties ever encountered swarming ladybugs, not even on that peak. I believe we can account for the situation there by assuming the following behavior by members of the local populations of coccinellids:

In early July thousands of adults accumulate on the summit of Allen Mountain (and not on neighboring peaks, even though several are approximately the same height). Many of them mate during this lateral migration, then after a day or two on the mountain the swarm disperses, most individuals flying to the prairies a few miles away. There the eggs are laid about five days after mating, and the adults and larvae share the same habitat during much of the summer, feeding on aphids and other small insects. In autumn the newly-emerged adults (possibly accompanied by many of the year-old individuals) slowly migrate to the mountain-top again. During Indian Summer (in October) they return to the valleys around Allen Mountain and form overwintering masses in protected places, under an insulating blanket of heavy snow.

The concentration of dead bodies beneath the summit rocks in spring 1952 probably resulted from the unusually heavy snows of the preceding fall (359 inches at Marias Pass as compared with the normal 239 inches there). If the beetles were so completely entombed by snow that they could not escape to the valleys, they were certain to freeze to death during the winter (in the prairies 5,000 vertical feet below the summit the winter temperatures often sink below —40°F.).

It is hoped that future observations will either verify or disprove the hypothesis outlined above. Many authors have commented on this curious behavior, but there seems to be much disagreement among them. Some

have stated that the beetles do NOT mate while on the peaks, but I observed many in coitus on Yakima Peak, Pinnacle Peak, and Telescope Peak (California). Many authors have noted that most summit masses are predominantly a single species, but there are other observations of mixed congregations. Balduf believes that the ascent of the beetles to mountain peaks in late fall and their occasional overwintering at high elevations "seems explicable in terms of air current." Many persons have observed them working upward on windless days or even advancing against the wind, hence it seems doubtful that winds are primarily responsible. Also, they are often seen flying about near mountain-tops on calm days when they could easily fly downhill in any direction without difficulty. It is true that Snyder saw hundreds of them being blown past him at the 9,000 foot elevation in Utah, but possibly they were merely being aided in their instinctive ascent by a favorable wind and would otherwise have been forced to crawl uphill or await a cessation or change of the wind. I am convinced that winds and convection currents are defintely *not* responsible for the lateral migrations of these insects. Balduf also noted increases in the proportion of fat to water in the body of the beetles after a season of intensive feeding, which seems to make them lose their hunger and wander aimlessly about. The distinctive odor of the hypodermal secretions of the beetles probably attracts migrating individuals toward the aggregations in certain favored places (although other places, apparently just as favorable, have no beetles). This causes tremendous accumulations of the adults in some places, including the vast over-wintering masses in sheltered valleys.

Possibly the major causes of these mass movements are then: (1) an urge to congregate prior to mating in the spring; (2) a subsequent dearth of food causing the beetles to leave the summit; (3) the high valley temperatures coupled with a condition of lipoid satiety in the fall impelling them to wander aimlessly, often retracing their route to the mountain-top; (4) the increasingly frigid temperatures of early winter, driving them down into more sheltered places and (5) the attraction of the hypodermal secretions resulting in their gathering into tremendous over-wintering masses in appropriate places, covered by sufficient snow to protect them from fatal temperatures. Whatever the causes and effects, the phenomenon is common wherever there are large mountains.

The same factors which regulate the mass migrations to and from Allen Mountain probably are in effect elsewhere in western United States. In addition to the congregation of *Hippodamia oregonensis* on Pinnacle Peak, Washington, I have also encountered this species on near-by Yakima Peak (6,231 feet high, just east of Mt. Rainier). They were

swarming there on 20 September 1952, in addition to which there were hundreds of year-old ladybug carcasses beneath the summit rocks. The unusually cold summer and early heavy snows of 1951 struck there as well as in Montana, and the dead bodies on the peaks in both areas the following summer must have been a result of this widespread cold wave. The migration to the summit is apparently a rapid process and the beetles do not linger there long, hence if one is a few days too early or too late he may miss the swarming activity entirely. This could account for their abundance on Yakima Peak on 20 September 1952 and their absence there on 9 September 1956, as well as explaining their sudden appearance on Allen Mountain in early July after being absent near the end of June (1956). On 18 September 1951 I observed thousands of ladybugs migrating up the lofty southwest shoulder of Mt. Shuksan, near the northwest corner of Washington, in Mt. Baker National Forest, but was unable to determine how near the summit they were at that time. In addition to the Montana and Washington records mentioned above, ladybird beetles have also been found swarming in Oregon, Idaho, Utah, California, Arizona, and New Mexico. Chapin (1946) mentions the following four collection reports: Knowlton and Nye got 68 specimens of *Hippodamia 5-signata* (''typical'' variety mixed with the heavily spotted variety *uteana* Csy.) above 9,700 feet on Mt. Logan, Utah (May 13, 1939). Dr. C. G. Abbott collected 2,856 over-wintering individuals of *H. convergens* Guérin (with all degrees of maculation of elytra represented) near the Smithsonian Institution Solar Observing Station at Tyrone, New Mexico. H. S. Barber collected 188 specimens of *H. 5-signata* on the 8,270 foot summit of Peavine Peak, Nevada (near Reno) on 16 January 1923. Most individuals there were the heavily spotted variety *uteana* Csy., but a few were the ''typical'' variety. Further south, this spotted variety was observed by Th. Dobzhansky on a 5,500 foot peak in the Argus Mountains near Death Valley, California, on 30 May 1933. I personally encountered thousands of ladybugs at the summit of Telescope Peak (11,000 vertical feet directly above Death Valley) on 26 March 1956. Dr. Kenneth Hagen identified these as *H. 5-signata uteana* Csy., and notified me that he has found them abundant in Death Valley (Furnace Creek Ranch) during the month of April.

Elsewhere in the world, Dr. M. S. Mani, during his entomological expeditions into the Himalayas of India, has often found ladybugs. One mass assemblage of *Coccinella septempunctata* L. was observed and photographed on a glacier near Lakka Pass (15,000 foot elevation) in the Dholadhar Range. Professor Dobzhansky observed that accumulations of ladybugs on mountains in Turkestan (1925) were always on bare, un-

forested peaks which the wind kept free of snow. He estimated that these masses contained 60,000 to 70,000 beetles or more. A high percentage of the individuals in each mass belonged to the same species, but often there were a few individuals of several other species present.

The accounts of beetles overwintering on the mountain-tops do not necessarily dispute the belief, stated earlier, that they overwinter in the valleys in mountainous areas of western United States. Indeed, the lower, warmer mountains and hills in this country often are chosen as overwintering sites by these insects. Unless there is a great difference in amount of snow cover, the mountain tops or the south-facing slopes near them are likely to be so warmed by the sun that they are more favorable than lower, more shaded localities. Johnson (1910) collected 15,415 *H. 5-signata* from a single mass atop a butte near Fairfield, Washington, and in the southwestern states such mountain-top estivations are common. Nevertheless, I believe it is very unlikely that ladybugs will intentionally overwinter on the high, frigid, snowy peaks of the Cascades, the Rockies, or the Sierra, and it is these "major" peaks where the true alpine conditions exist with which I am primarily concerned in this article.

There are usually no ill effects from the migratory habit, but occasionally this seasonal swarming results in disaster for the beetles, as in the case of the severe autumn of 1951. Another hazard for the aggregations of beetles is the possibility that they may be devoured by animals which are not repelled by their hypodermal secretions. On 10,000 foot McDonald Peak (in the Mission Range of Montana) twelve grizzly bears were observed near the summit by John Romer (1955). They were overturning rocks and eating something beneath them. Later investigation revealed great masses of ladybird beetles under the rocks, and apparently the bears considered them edible. Another Montanan reported seeing grizzlies rolling over rocks above timberline on the same peak and eating the accumulations of ladybugs. John Stark (1955) investigated these reports, and estimated that five to ten gallons of the beetles could be collected per day in the vicinity. This brings up the possibility of collecting them and selling them to farmers to aid in the control of aphid infestations, but according to G. C. Quick of Phoenix, Arizona (Kobler, 1953), the only species suitable for rearing and liberation as a biological control agent is *Hippodamia convergens* Guérin. In his vicinity, he collects them and rears them and sells them by the gallon for agricultural purposes. Unfortunately, the adult beetles still respond to their inexplicable urges, and soon forsake the lowlands to migrate to the tops of the hills surrounding their new home.

As the years pass, more and more entomologists will find their way to

the lofty summits where these amazing insects are wont to gather. Surely someday their fascinating secrets will be revealed, and another amazing chapter can be added to our accounts of insect biological phenomena. I have appealed to all mountain-climbers in the Pacific Northwest to aid in this research by reporting all aggregations of coccinellids they encounter, with the pertinent data concerning them. The same appeal is extended to all readers of the Coleopterists' Bulletin. This coordinated effort should soon result in bettering our understanding of the unusual behavior of these hordes of persistent six-legged mountaineers.

USEFUL REFERENCES

Balduf, W. V. 1935. The bionomics of entomophagous Coleoptera. St. Louis: John Swift.

Chapin, E. A. 1946. Review of the New World species of *Hippodamia* Dejean. Smithsonian Misc. Coll. **106** (11): 1-39, plus 22 pls.

Chapman, J. A. 1954. Studies on summit frequenting insects in western Montana. Ecology **35** (1): 41-49, 5 figs.

Chapman, J. A., Romer, J. I. and J. Stark. 1955. Ladybird beetles and army cutworm adults as food for grizzly bears in Montana. Ecology **36**: (1): 156-58.

Dobzhansky, Th. 1925. Ueber das Massenauftreten einiger Coccinelliden im Gebirge Turkestans. Zeits. Wiss. Insektbiol. **20**: 249-56.

Edwards, J. G. 1956. Entomology above timberline. Mazama Club Annual (Portland, Oregon) **38** (13): 13-17.

Ewing, H. E. 1913. Notes on Oregon Coccinellidae. Jour. Econ. Ent. **6**: 404-407.

Johnson, R. H. 1910. Determinate evolution in . . lady-beetles. Carnegie Inst. Publ. No. 122, 55 pp.

Kobler, J. 1953. He lives on ladybugs. Colliers Magazine, Sept. 4, 1953, pp. 82-85, illus.

Mani, M. S. and S. Singh. 1955. Entomological survey of the Himalayas, Part XIII. Second entomological expedition to North-west (Punjab) Himalayas. Agra Univ. Jour. of Research **4** (suppl.): 717-40, 17 figs., 1 pl.

Poulton, E. B. 1904. A possible explanation of insect swarms on mountain-tops. Trans. Ent. Soc. London 1904: xxiii-xxvi.

HARPALUS PUNCTICEPS STEPH. ON LONG ISLAND, N. Y.

In his annual shipment of beetles, Roy Latham of Orient sent in specimens of the above ground beetle collected by him as follows:

Orient, L. I., N. Y., April 30, 1954 a female.

Montauk, L. I., N. Y., June 9, 1956 a male.

Orient, L. I., N. Y., Sept. 5, 1956 a female.

Orient, L. I., N. Y., Sept. 7, 1956 a female.

The females were taken at lights on Roy's house. The single female collected in 1954 had been sent in at the time but was not recognized. All the specimens were sent to Carl H. Lindroth of Lund, Sweden who verified the identification as *Harpalus* (*Ophonus*) *puncticeps* Steph. (*angusticollis* J. Mueller). No doubt the species must be spreading in the sand on Long Island and collecting this Spring might turn up a good series for Lindroth writes that the species is common in harbours on the SW coast of England. Henry Dietrich, Ithaca, N. Y.